In the Claims:

This listing replaces all prior versions.

1. (original) An integrated microcircuit assaying arrangement comprising:

a circuit-supporting substrate;

a light detection circuit on the substrate and arranged to detect an optical characteristic of a biological sample and generate a signal as a function of the detected optical characteristic; and

a processing circuit communicatively coupled to the light detection circuit to receive the signal and including an instruction-responsive processor on the substrate and adapted to process the signal and to provide an assay output corresponding to the detected optical characteristic.

2. (original) The microcircuit assaying arrangement of claim 1, wherein the processing circuit further comprises:

a data storage circuit on the substrate, coupled to the processor and adapted to store data, the processor being adapted to retrieve data from the data storage circuit for processing the signal and providing the output.

3. (original) The microcircuit assaying arrangement of claim 1, wherein at least one of the light detection circuit and the processing circuit includes MOS-based circuitry.

4. (original) The microcircuit assaying arrangement of claim 1, wherein the light detection circuit includes a photodetector circuit that electrically responds to light from the biological sample and generates the signal, and further comprising a temperature controller configured and arranged to control the temperature of the light detection circuit.

5. (original) The microcircuit assaying arrangement of claim 4, wherein the photodetector circuit includes at least one photodiode adapted to electrically respond to light from the biological sample.

6. (original) The microcircuit assaying arrangement of claim 1, further comprising a color filter adapted to remove a portion of the signal generated by the light detection circuit that corresponds to a particular color of light

7. (original) The microcircuit assaying arrangement of claim 1, further comprising a clock generation circuit on the substrate and adapted to generate a clock signal, the processing circuit being operable in response to the clock signal.

8. (original) The microcircuit assaying arrangement of claim 7, wherein the processing circuit is adapted to operate at a selected speed in response to programming data.

9. (original) The microcircuit assaying arrangement of claim 1, wherein the microcircuit assaying arrangement includes both analog and digital circuitry, further comprising an analog-to-digital converter (ADC) on the substrate and adapted to convert an analog signal to a digital signal for generating said signal as a function of the detected optical characteristic.

10. (original) A microcircuit assaying chip comprising:

a light detection circuit on the chip and adapted to detect light from a biological sample and generate a signal including pixel data representing the detected light; and

a processing circuit communicatively coupled to the detection circuit for receiving the pixel data and including a processor on the chip, the processor adapted to process the pixel data and to provide an output corresponding to the detected light represented by the pixel data.

11. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a plurality of light detectors adapted to detect the light from the biological sample and generate the pixel data, and wherein the processing circuit is programmed to provide the output including pixels having pixel data from the light detectors.

12. (original) The microcircuit assaying chip of claim 11, wherein the photosensitive area is matched to the assay size from 1 μm to 2 mm.

13. (original) The microcircuit assaying chip of claim 12, wherein the processing circuit is programmed to compensate for the quantum efficiency of a reaction involving the biological sample.

14. (original) The microcircuit assaying chip of claim 12, wherein the plurality of light detectors are in an array and wherein the processing circuit is adapted to include, for each pixel in the output, pixel data from a block including at least two immediately adjacent light detectors.

15. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a photodiode adapted to detect the light by converting photons received from the biological sample into a charge having a value that is a function of the intensity of the detected light to generate the signal including pixel data having a value that is representative of the charge.

16. (original) The microcircuit assaying chip of claim 15, wherein the processing circuit is adapted to scale the value of the pixel data in the generated signal to compensate for the quantum efficiency of a reaction with the biological sample.

17. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit includes analog circuitry, further comprising a digital-to-analog converter (DAC) adapted to convert a digital control signal to an analog signal for operating the detection circuit.

18. (original) The microcircuit assaying chip of claim 10, further comprising a control circuit coupled to an external input indicative of the stimulation of the biological sample and adapted to control the light detection circuit to detect light at a selected time in response to the external input for coordinating the light detection with the stimulation.

19. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit and processing circuit are adapted for capturing a single image of the biological sample using light detected by the light detection circuit.

20. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit and processing circuit are adapted to capture a plurality of images of the biological sample using the light detected by the light detection circuit and wherein the processor is adapted to provide the output including image data.

21. (original) The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a plurality of light detectors, at least two of the light detectors being adapted to detect different light characteristics, and wherein the processing circuit is adapted to detect a characteristic of the biological sample using different characteristics of the biological sample detected by the at least two light detectors.

22. (original) The microcircuit assaying chip of claim 10, further comprising a noise reduction circuit adapted to reduce noise in the assay output.

23. (original) The microcircuit assaying chip of claim 22, wherein the noise reduction circuit includes a background subtraction circuit adapted to reduce background noise in the signal generated by the light detection circuit.

24. (original) The microcircuit assaying chip of claim 23, wherein the background subtraction circuit removes the deterministic component of the signal generated by the light detection circuit as engendered by photodetector dark signal, chemical background or external excitation sources.

25. (original) The microcircuit assaying chip of claim 22, wherein the noise reduction circuit includes a signal averaging circuit adapted to reduce independent noise components in the signal generated by the light detection circuit.

26. (original) An assaying arrangement comprising:

a sample preparation arrangement configured and arranged for preparation of a biological sample for assaying;

a substrate;

a memory circuit on the substrate;

an array of pixels on the substrate, each pixel including a photodetector adapted to detect light from the sample and to read out data corresponding to the detected light;

a decoder circuit adapted to receive the data read out from the pixels and to generate a signal in response to the data, the generated signal including data linking the location of the pixels in the array to the light detected at each pixel;

an analog-to-digital converter adapted to convert analog data from the decoder circuit into digital data, the memory circuit being adapted to store the converted data; and

a processor on the substrate, communicatively coupled to the memory circuit and adapted to receive and process the stored digital data and to provide an output corresponding to the detected optical characteristic.

27. (original) The assaying arrangement of claim 26, further comprising:

a controller adapted to synchronize the operation of the circuitry on the substrate and control the flow of information between the circuits on the substrate; and

a digital-to-analog converter (DAC) adapted to convert digital signals from the controller into analog signals for controlling the photodetectors and the decoder circuit.

28. (original) The assaying arrangement of claim 27, wherein the controller is adapted to synchronize the detection of light by the photodetector with stimulation of the biological sample that causes a light emission.

29. (original) The assaying arrangement of claim 27, wherein the array of pixels includes pixels adapted to detect different characteristics and wherein the controller is adapted to selectively power and process the different photodetectors for detecting the different characteristics.

30. (original) The assaying arrangement of claim 26, further comprising a clock generation circuit on the substrate and adapted to generate a clock signal, the circuits on the substrate being operable in response to the clock signal.

31. (original) The assaying arrangement of claim 26, wherein the sample preparation device includes:

at least one reservoir; and

a fluid delivery arrangement adapted to deliver the biological sample to the at least one reservoir.

32. (original) The assaying arrangement of claim 31, wherein the fluid delivery arrangement is further adapted to deliver a reagent to the at least one reservoir.

33. (original) The assaying arrangement of claim 31, wherein the sample preparation device includes a plurality of reservoirs coupled via micro channels.

34. (Currently Amended) The assaying arrangement of claim 26, wherein the sample arrangement involves ~~directly~~ directly coupling or immobilizing the samples to the photodetector substrate.

35. (original) The assaying arrangement of claim 34, wherein the photodetector substrate is etched with at least one reservoir.

36. (original) The assaying arrangement of claim 31, wherein the sample preparation device is directly coupled to the sensor substrate.

37. (original) The assaying arrangement of claim 31, wherein the sample preparation device is optically coupled to the sensor substrate.